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*Comments of the **Natural Resources Defense Council** on  
Emissions Performance Standard Update Documents*

**I. Introduction**

The Natural Resources Defense Council thanks the Washington Department of Commerce (hereafter “Commerce”) for the opportunity to comment on documents pertaining to the Emissions Performance Standard (EPS) Update.

The Natural Resources Defense Council (NRDC) is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.3 million members and online activists nationwide, served from offices in New York, Washington D.C., San Francisco, Los Angeles, Chicago and Beijing.

**II. Commerce Is Clearly Authorized by Law to Update the EPS**

RCW 80.80.050 directs Commerce to “provide an opportunity for interested parties to comment on the development of a survey of new combined-cycle natural gas thermal electric generation turbines commercially available and offered for sale by manufacturers and purchased in the United States to determine the average rate of emissions of greenhouse gases for these turbines.” The Department has completed such a survey in an inclusive and transparent manner and offered ample opportunity for participation in the discussions, which were openly advertised, and also for public comment.

In the enacting statute, the Legislature found that “[i]t is vital to ensure all electric utilities internalize the significant and underrecognized cost of emissions and to reduce Washington consumers' exposure to costs associated with future regulation of these emissions, which is consistent with the objectives of integrated resource planning by electric utilities under chapter 19.280 RCW.”<sup>1</sup> In addition, the law clearly directs Commerce to “adopt by rule the average available greenhouse gases emissions output every five years beginning five years after July 22, 2007”<sup>2</sup>. It is therefore entirely within the spirit and the letter of the law for Commerce to conduct a survey of achievable emission rates from new combined-

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<sup>1</sup> RCW 80.80.005.

<sup>2</sup> RCW 80.80.050.

cycle natural gas turbines and to update the EPS to reflect advances in technology and performance since 2007. The purpose of the law is to ensure that environmental performance stays abreast with technological advances, and to raise the minimum standards accordingly. This will inevitably mean that some existing plants may no longer be able to function under the same commercial arrangements as in the past, but that does not constitute reason not to update the EPS. The very purpose of the EPS is to raise the bar. As we discuss below, the new proposed level is well within reach of what new technology can achieve, and in fact within what most existing natural gas combined cycle plants in the state can achieve.

### **III. There Is Clear Need and Value in Maintaining and Updating the Washington EPS Over and Above Current Federal Requirements**

RCW 80.80.080 directs the Department of Ecology in consultation with other state agencies to “review the greenhouse gases emissions performance standard established in this chapter to determine need, applicability, and effectiveness no less than every five years following July 22, 2007, or upon implementation of a federal or state law or rule regulating carbon dioxide emissions of electric utilities, and report to the legislature”. We see a clear need in maintaining the EPS in the state. It serves the unique purpose of ensuring a minimum greenhouse gas performance in new contracts longer than five years, thus preventing lock-in of unacceptably high emission rates that would expose taxpayers and the state to the costs of carbon regulation and climate change. We also find that no federal law or regulation has rendered the EPS or its update redundant. Even though a number of federal regulations are dealing with similar or related issues, the Washington EPS still serves key purposes and should be maintained and updated.

Specifically, proposed Standards of Performance for Greenhouse Gas Emissions for Stationary Sources; Electricity Utility Generating Units (“EGU NSPS”)<sup>3</sup> by the Environmental Protection Agency’s (EPA) does not supersede the EPS. First, EPA’s proposal has not yet been promulgated. Even though we strongly support its expeditious promulgation, it is erroneous to assume that this proposed rule will be finalized, or that it will supersede the EPS. In fact, similar factions of industry (such as electric utilities) are arguing against the EGU NSPS while at the same time claiming that it will supersede the EPS or make it redundant. It is therefore vital for Washington to maintain its EPS, both as a safeguard against the possibility that the federal standard will not be promulgated, and in order to increase the chances of a federal standard being adopted. Moreover, Section 116 of the Clean Air Act<sup>4</sup> clearly allows states to go further than minimum federal standards, as Washington’s updated EPS would do.

In addition, greenhouse gas emissions from the largest stationary sources are now covered by EPA through the Prevention of Significant Deterioration (PSD) and Title V Operating Permit Programs. EPA’s GHG Tailoring Rule, issued in May 2010, set initial emission thresholds for PSD and Title V permitting based on carbon dioxide equivalent emissions, essentially limiting such requirements to the largest

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<sup>3</sup> 72 Fed. Reg. 22,392 (Apr. 13, 2012).

<sup>4</sup> 42 USC §7416.

emitters only (Steps 1&2). EPA's Step 3 of the GHG Tailoring Rule, issued on June 29, 2012, continues to focus GHG permitting on the largest emitters by retaining the permitting thresholds that were established in Steps 1 and 2, among other things. However, EPA's PSD and Title V Operating Permit Programs in no way substitute for the Washington EPS. The nature of these permitting programs is case-by-case, and the process of establishing Best Available Control Technology (BACT) in no way guarantees a minimum greenhouse gas environmental performance for plants. EPA's relevant guidance<sup>5</sup> is also largely procedural and does not spell out specific control options that should be used, or specific levels of emissions that should be adhered to. Regardless of the level at which some permits under these EPA programs may have been set to date for natural gas combined cycle units, if Washington is to ensure absolute minimum levels of performance, then it cannot rely on these programs, and can and should continue to utilize its existing EPS structure.

#### **IV. The Proposed EPS Value Is Lenient and Easily Achievable Under Realistic Operating Conditions by Modern Plants, and Would Have Minimal Reliability or Cost Impacts**

The proposed level of 975lb CO<sub>2</sub>/MWh on a net basis<sup>6</sup> is lenient for a number of reasons. First, the use of figures from Gas Turbine World and manufacturer estimates, which Commerce utilized in its Emissions Calculator, is inherently conservative. The Gas Turbine World Handbook performance specifications are based on "new and clean" gas turbine ratings for net plant output and base load operation of a standardized reference plant, including losses and auxiliary loads, on natural gas fuel, at a temperature of 59F, sea level, and reasonably realistic steam cycle conditions. However, it should be noted that manufacturers employ conservative factors in establishing performance specifications, since they are subject to damages if the units do not perform as specified, resulting in a degree of built-in conservatism. This is possibly reflected in the Emissions Calculator, which shows a calculated average emission rate (excluding outliers) of 939 lb CO<sub>2</sub>/MWh vs. 875 lb CO<sub>2</sub>/MWh as reported, although the conservatism of some adjustment factors could also be responsible as discussed directly below.

In addition, Commerce has made adjustments in its calculations to allow for "real-life" conditions and scenarios that CCCTs could face. These include capacity factor, duct firing, performance degradation and ageing, startups, shutdowns and partial load operation, temperature and humidity. The mere use of these adjustment factors shows that Commerce attempted to derive a realistically achievable EPS level. However, as we show below, some of the factors used are generous.

##### *Temperature adjustment*

The OEM design specifications are based on 59° F. We agree that an increase in ambient air temperature reduces gas turbine power with a proportionate increase in heat rate and CO<sub>2</sub> emissions. However, inlet cooling is available and routinely used to increase power output of gas turbines. Inlet cooling improves efficiency during high ambient temperature operation of 5 percent to 25 percent of gas turbine

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<sup>5</sup> "PSD and Title V Permitting Guidance for Greenhouse Gases", EPA-457/B-11-001, March 2011.

<sup>6</sup> All figures thereafter are also quoted on a net basis, unless otherwise stated.

nameplate rating, reducing fuel consumption and hence reducing CO<sub>2</sub> emissions.<sup>7</sup> A number of inlet cooling technologies are commercially available, including wetted media, fogging, wet compression, and chilling. In fact, inlet cooling is used to reduce inlet temperatures below 59 °F, thus increasing efficiency to better than ISO conditions.

#### *Ageing penalty*

Performance degradation is an important factor to be considered, as the heat rate of the facility will gradually deteriorate between overhauls. Our review of the literature indicates that 3.5 percent could be an overestimate given maintenance practices that are widely used and known to improve output (and revenue) and indeed, that 3 even percent is likely to be too high for newly designed and constructed units that employ efficient designs.<sup>8</sup> Published industry information asserts that good maintenance practices, including frequent offline water washing, reduce both the amount of performance degradation and the rate of performance degradation.<sup>9</sup>

#### *Duct firing*

Commerce has corrected for the reduction in efficiency associated with less than full load operation, but has not addressed the issue of the increased rate of emissions associated with the use of duct burners to serve peak power needs. We believe that the use of duct burners is embedded in the data and is not significant in terms of affecting the annual CO<sub>2</sub> emission rate. However, the specific emissions associated with the use of duct burners in the publicly available data are difficult to disaggregate. Industry commenters may argue that the use of duct burners justifies a higher emission standard than is suggested by the performance specifications relied on by Commerce. We suggest that, rather than raising emission limits for all units, Commerce treat emissions from duct burners as peaking emissions, subject to the hourly limitations recommended in this comment for other peaking units, and not included for purposes of determining compliance with the emission limits for intermediate and base-load units. This could be accomplished by measuring the amount of natural gas consumed by the duct burners and applying the CO<sub>2</sub> emission factor of 117 lb CO<sub>2</sub>/MMBtu and by measuring the increased generation that results from the use of the duct burners. Both the increased generation and the increased CO<sub>2</sub> would be subtracted from the annual emission calculation.

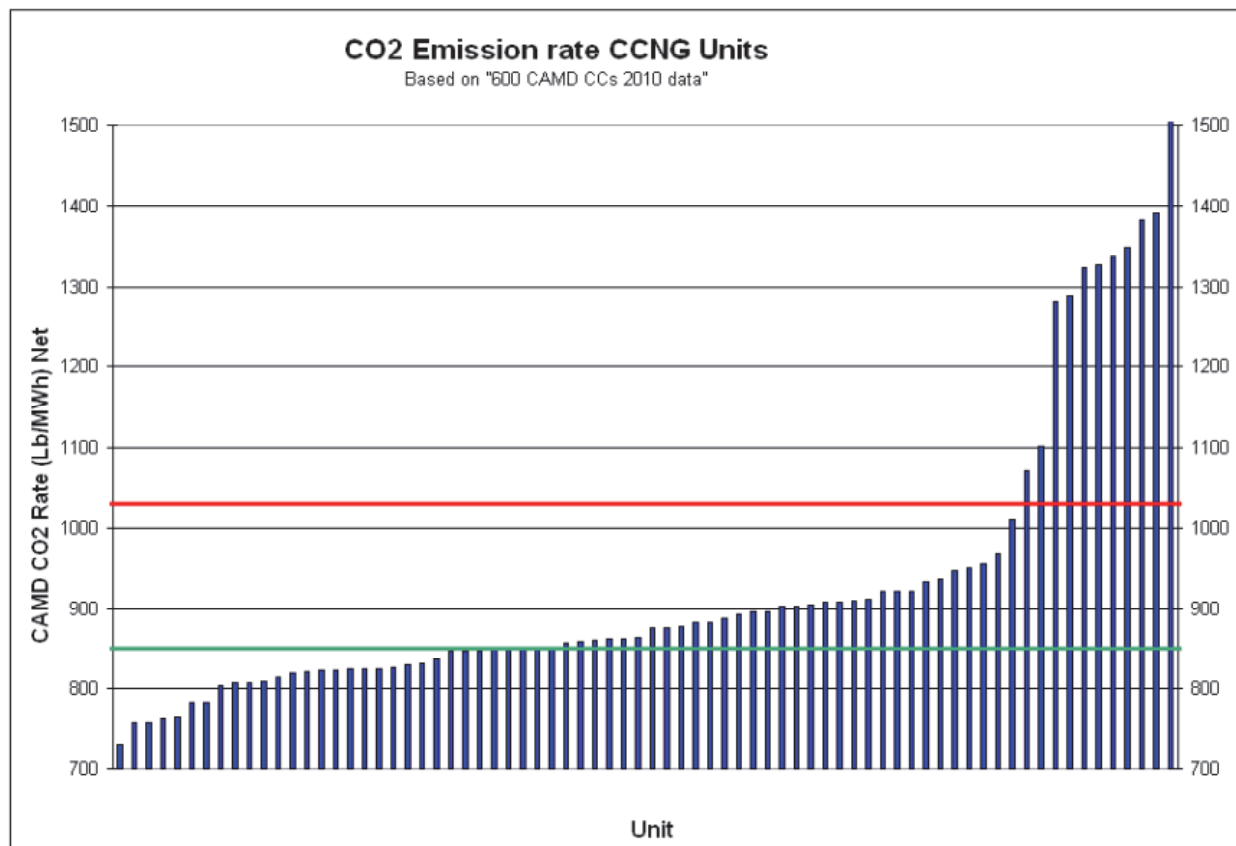
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<sup>7</sup> Gas Turbine Inlet Cooling. Scope, Cost and Performance for New and Retrofit Power Plant Projects, 2010 Gas Turbine World Handbook, pp. 32 - 39. This article reports CO<sub>2</sub> emissions from a combined cycle plant using turbine inlet cooling of 700 lb/MWh (Fig. 6). See also: D.V. Punwani, Turbine Inlet Cooling: Increased Energy Efficiency & Reduced Carbon Footprint Aspects for District Energy Systems, June 13-16, 2010, [http://www.turbineinletcooling.org/News/Avalon\\_IDEA2010June.pdf](http://www.turbineinletcooling.org/News/Avalon_IDEA2010June.pdf).

<sup>8</sup> See, e.g., I.S. Diakunchak, Performance Deterioration in Industrial Gas Turbines, Journal of Engineering for Gas Turbines and Power, v. 114, April 1992, pp. 161-168 (1%); S. Can Gulen and Sal Paolucci, Real-time On-line Performance Diagnostics of Heavy-duty Industrial-gas Turbines, Transactions of the ASME (2%), Available at: [http://www.thermoflow.com/WALK\\_GTEYE/ASME\\_2000-GT-312\\_ThermoflowGTEYE.pdf](http://www.thermoflow.com/WALK_GTEYE/ASME_2000-GT-312_ThermoflowGTEYE.pdf)

<sup>9</sup> J. Petek and P. Hamilton, Performance Monitoring for Gas Turbines, Orbit, v. 25, no. 1, 2005; Emerson Process Management, Gas Turbine Engine Performance, January 2005.

### Comparison with existing unit emission rates



The figure above shows the emission rates from the units in EPA's data set, the EPA's EGU NSPS proposed limit of 1,000lb CO<sub>2</sub>/MWh and a possible alternative of 825-850 lbs/MWh, all expressed as net emissions. Note that approximately one-half of the existing units have already met the recommended alternative limit. It should be noted that these units have experienced in-use variation in temperature, altitude and performance degradation with time, and so incorporate the factors that Commerce assigns to manufacturers' performance specifications.

A similar picture is readily evident when examining Commerce's figures<sup>10</sup> on existing plants in the Washington system: only two older units exceed the current standard, while two units may exceed standard if it is set at 975lb/MWh. The latter two units represent approximately 1.4% of electric generation in the state. Meeting the new proposed EPS level is therefore easily achievable, and a substantially lower level is arguably justified. This is also consistent with national data.

Additionally, according to data by Commerce<sup>11</sup>, currently natural gas combined cycle units serve 10 to 11 percent of Washington's electric load. Potential non-compliance by two of these units can hardly have a significant cost or reliability impact on the system, especially when considering that these units would

<sup>10</sup> Washington State Department of Commerce, "Emission Performance Standard Stakeholder Meeting"; presentation on August 6, 2012.

<sup>11</sup> Id.

not be precluded from generating, but merely from entering into long term contracts. Further, according to the same data, new efficient units are less expensive than less efficient ones. Updating the EPS level would therefore drive investment in a desirable direction for customers.

## **V. Conclusions**

The Washington EPS serves an important purpose for the people of the state in terms of reducing costs and greenhouse gas emissions to the atmosphere. Its role is justified and additional over existing and proposed federal laws and regulations. The new proposed level for the EPS is lenient and easily achievable through today's technology, and should be lowered. The economic and reliability impacts of updating the EPS would be negligible. We urge the expeditious revision of the EPS level as authorized and mandated by law.

Respectfully submitted on August 28<sup>th</sup>, 2012,

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